

Claims

Having described the invention, the following is claimed:

1        1. A surface acoustic wave device including a transducer electrode  
2        formed on a substrate, the electrode having a plurality of layers, and at least one of the  
3        layers being metal and another of the layers being a material for providing a hardening  
4        effect to the metal layer.

1        2. A surface acoustic wave device as set forth in claim 1, wherein the  
2        material is a metal and oxygen compound.

1        3. A surface acoustic wave device as set forth in claim 2, wherein the  
2        metal and oxygen compound includes aluminum.

1        4. A surface acoustic wave device as set forth in claim 3, wherein the  
2        metal and oxygen compound is aluminum oxide.

1        5. A surface acoustic wave device as set forth in claim 1, wherein the  
2        metal of the material includes aluminum.

1        6. A surface acoustic wave device as set forth in claim 1, wherein the  
2        substrate is planar, each of the layers having a portion extending parallel to the  
3        substrate, the parallel extending portions being vertically stacked relative to the  
4        substrate, at least some of the layers also having portions extending transversely to the  
5        substrate, and the transverse extending portions being laterally stacked relative to the  
6        substrate.

1        7. A surface acoustic wave device as set forth in claim 6, wherein the  
2        second layer, of hardening material, has a portion extending laterally about the first  
3        layer, of metal, for preventing migration of the metal.

1           8.     A surface acoustic wave device as set forth in claim 6, wherein the  
2     transverse portions do not extend onto the substrate beyond the electrode.

1           9.     A surface acoustic wave devices as set forth in claim 6, wherein the  
2     material is a metal and oxygen compound.

1           10.    A surface acoustic wave device as set forth in claim 9, wherein the  
2     metal and oxygen compound includes aluminum.

1           11.    A surface acoustic wave device as set forth in claim 10, wherein the  
2     metal and oxygen compound is aluminum oxide.

1           12.    A surface acoustic wave device as set forth in claim 6, wherein the  
2     metal of the material includes aluminum.

1           13.    A surface acoustic wave device as set forth in claim 1, wherein the  
2     transducer electrode is electrically connected to a metal component that permits  
3     electrical connection of the surface acoustic wave device to an electrical device  
4     external to the surface acoustic wave device, the electrode having a metal portion of a  
5     first metallization, and the component being of a second, different metallization.

1           14.    A surface acoustic wave device as set forth in claim 13, wherein the  
2     component includes a one of a bus bar and a bond pad.

1           15.    A surface acoustic wave device as set forth in claim 13, wherein the  
2     first metallization includes the metal portion of the electrode being made of a first  
3     metal, and the second metallization includes the component being made of a second,  
4     different metal.

1           16.    A surface acoustic wave device as set forth in claim 13, wherein the  
2    first metallization includes the metal portion of the electrode having a first thickness,  
3    and the second metallization includes the component having a second, different  
4    thickness.

1           17.    A surface acoustic wave device including a transducer electrode  
2    formed on a substrate, the electrode having a plurality of layers, and at least one of the  
3    layers being metal and another of the layers being a metal and oxygen compound.

1           18.    A surface acoustic wave device as set forth in claim 17, wherein the  
2    metal and oxygen compound includes aluminum.

1           19.    A surface acoustic wave device as set forth in claim 18, wherein the  
2    metal and oxygen compound is aluminum oxide.

1           20.    A method of making a surface acoustic wave device, the method  
2    including the steps of:

3                 providing a substrate; and  
4                 creating a transducer electrode having a plurality of layers on the  
5    substrate, including creating a metal layer and creating a layer of a material that  
6    provides a hardening effect to the metal layer.

1           21.    A method of making a surface acoustic wave device as set forth in  
2    claim 20, wherein the step of creating a layer of a material includes creating the layer  
3    of material as a metal and oxygen compound layer.

1           22.    A method of making a surface acoustic wave device as set forth in  
2    claim 20, wherein the step of creating a transducer electrode includes metal lift-off  
3    processing.

1           23.    A surface acoustic wave device including a transducer electrode  
2    electrically connected to a metal component that permits electrical connection of the  
3    surface acoustic wave device to an electrical device external to the surface acoustic  
4    wave device, the electrode having a metal portion of a first metallization, and the  
5    component being of a second, different metallization.

1           24.    A surface acoustic wave device as set forth in claim 23, wherein the  
2    component includes one of a bus bar and a bond pad.

1           25.    A surface acoustic wave device as set forth in claim 23, wherein the  
2    first metallization includes the metal portion of the electrode being made of a first  
3    metal, and the second metallization includes the component being made of a second,  
4    different metal.

1           26.    A surface acoustic wave device as set forth in claim 23, wherein the  
2    first metallization includes the metal portion of the electrode having a first thickness,  
3    and the second metallization includes the component having a second, different  
4    thickness.

*Sub A57*   1           27.    A surface acoustic wave device as set forth in claim 23, wherein the  
2    electrode has a plurality of layers, and at least one of one of the layers being metal and  
3    another of the layers being a material for providing a hardening effect to the metal  
4    layer.

1           28.    A surface acoustic wave device as set forth in claim 27, wherein the  
2    material is a metal and oxygen compound.

1           29.    A surface acoustic wave device as set forth in claim 28, wherein the  
2    metal and oxygen compound includes aluminum.

1           30.    A surface acoustic wave device as set forth in claim 29, wherein the  
2    metal and oxygen compound is aluminum oxide.

1           31.    A surface acoustic wave device as set forth in claim 27, wherein the  
2    metal of the material includes aluminum.

1           32.    A surface acoustic wave device as set forth in claim 27, wherein the  
2    substrate is planar, each of the layers having a portion extending parallel to the  
3    substrate, the parallel extending portions being vertically stacked relative to the  
4    substrate, at least some of the layers also having portions extending transverse to the  
5    substrate, and the transverse extending portions being laterally stacked relative to the  
6    substrate.

1           33.    A surface acoustic wave device as set forth in claim 32, wherein the  
2    second layer, of hardening material, has a portion extending laterally about the first  
3    layer, of metal, for preventing migration of the metal.

1           34.    A surface acoustic wave device as set forth in claim 32, wherein the  
2    transverse portions do not extend onto the substrate beyond the electrode.

1           35.    A surface acoustic wave device as set forth in claim 32, wherein the  
2    material is a metal and oxygen compound.

1           36.    A surface acoustic wave device as set forth in claim 35, wherein the  
2    metal and oxygen compound includes aluminum.

1           37.    A surface acoustic wave device as set forth in claim 36, wherein the  
2    metal and oxygen compound is aluminum oxide.

1           38.    A surface acoustic wave device as set forth in claim 32, wherein the  
2    metal of the material includes aluminum.

1           39.    A surface acoustic wave device including a transducer electrode  
2    electrically connected to a component that permits electrical connection of the surface  
3    acoustic wave device to an electrical device external to the surface acoustic wave  
4    device, the electrode having a metal portion made of a first metal, and the component  
5    being made of a second, different metal.

1           40.    A surface acoustic wave device including a transducer electrode  
2    electrically connected to a component that permits electrical connection of the surface  
3    acoustic wave device to an electrical device external to the surface acoustic wave  
4    device, the electrode having a metal portion of a first thickness, and the component  
5    being metal of a second, different thickness.

1           41.    A method of making a surface acoustic wave device, the method  
2    including the steps of:  
3                   making a transducer electrode, including making the electrode to have  
4    a metal portion of a first metallization; and  
5                   making a metal component, electrically connected to the electrode, that  
6    permits electrical connection of the surface acoustic wave device to an electrical  
7    device external to the surface acoustic wave device, including making the component  
8    of a second, different metallization.

1           42.    A method of making a surface acoustic wave device as set forth in  
2    claim 41, wherein the steps of making a transducer electrode and making a metal  
3    component include metal lift-off processing.